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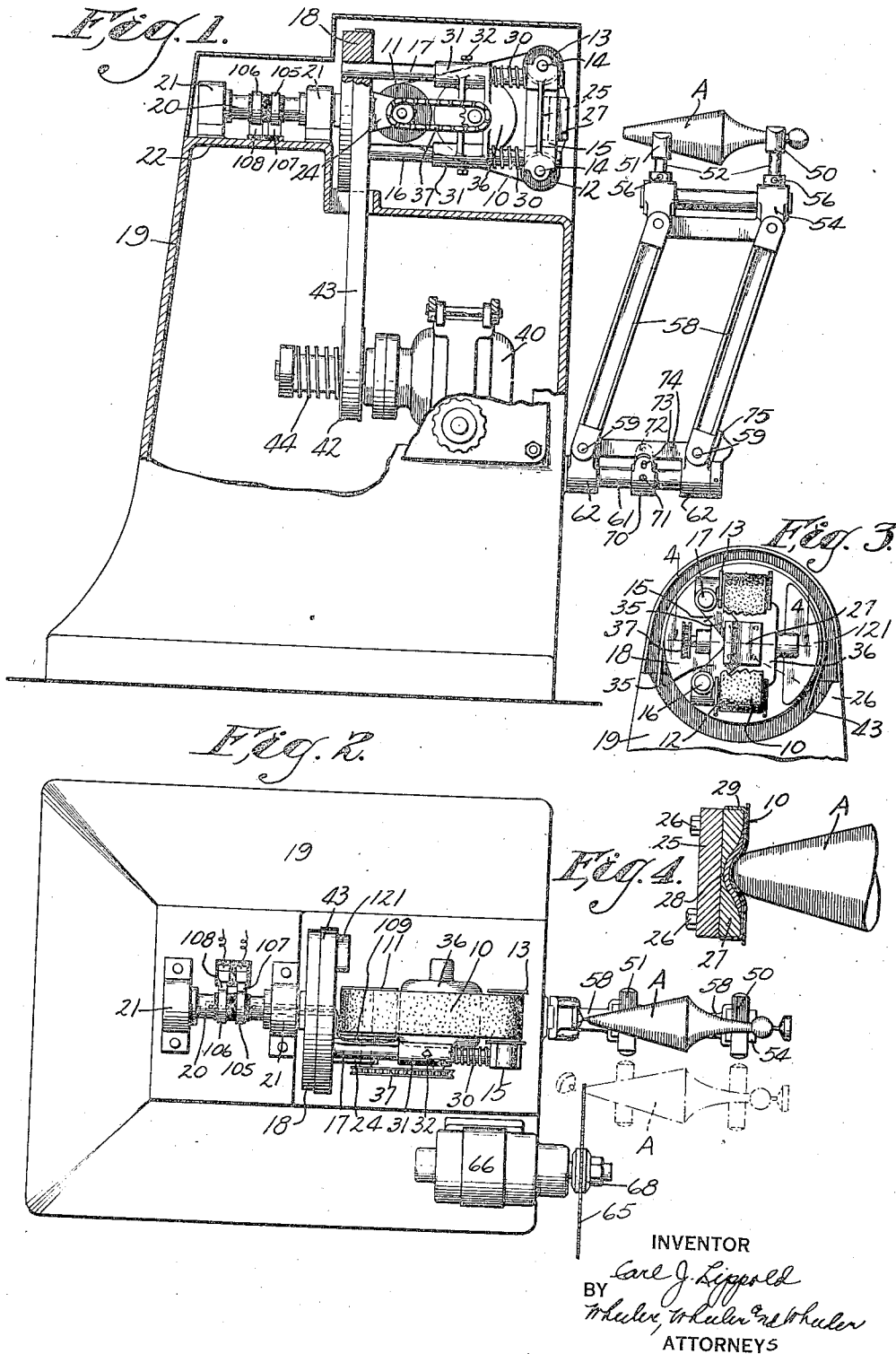
C. J. LIPPOLD

2,109,069

SANDING AND POLISHING MACHINE

Filed June 24, 1935

2 Sheets-Sheet 1



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Fig. 5.

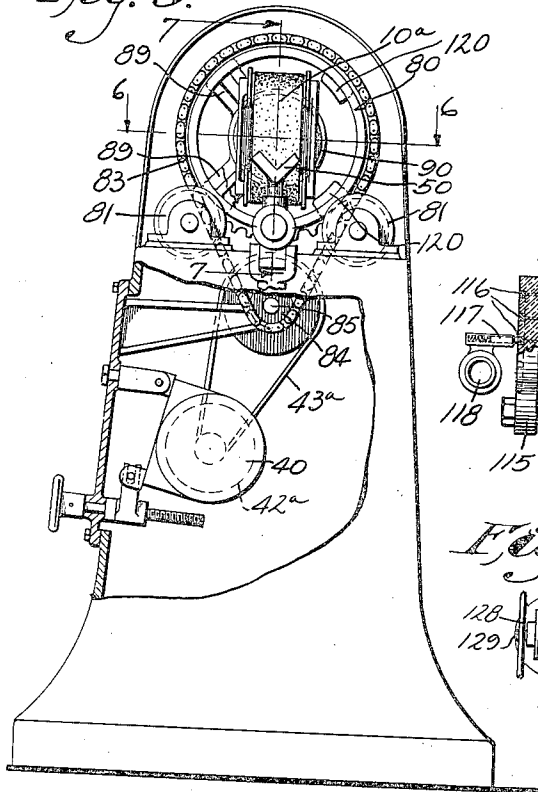


Fig. 6.

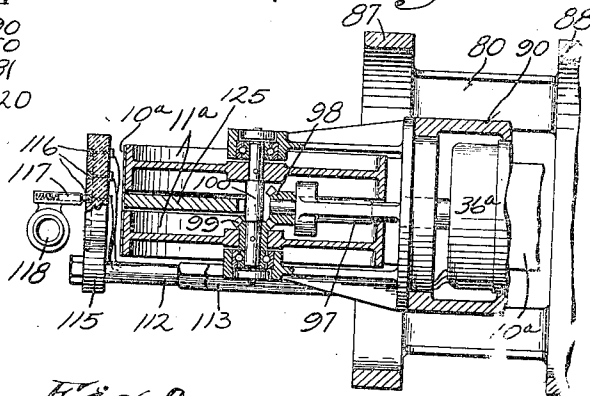


Fig. 8.

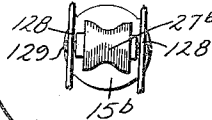


Fig. 9.

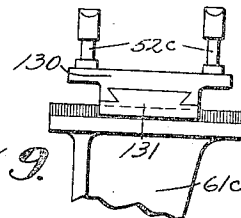
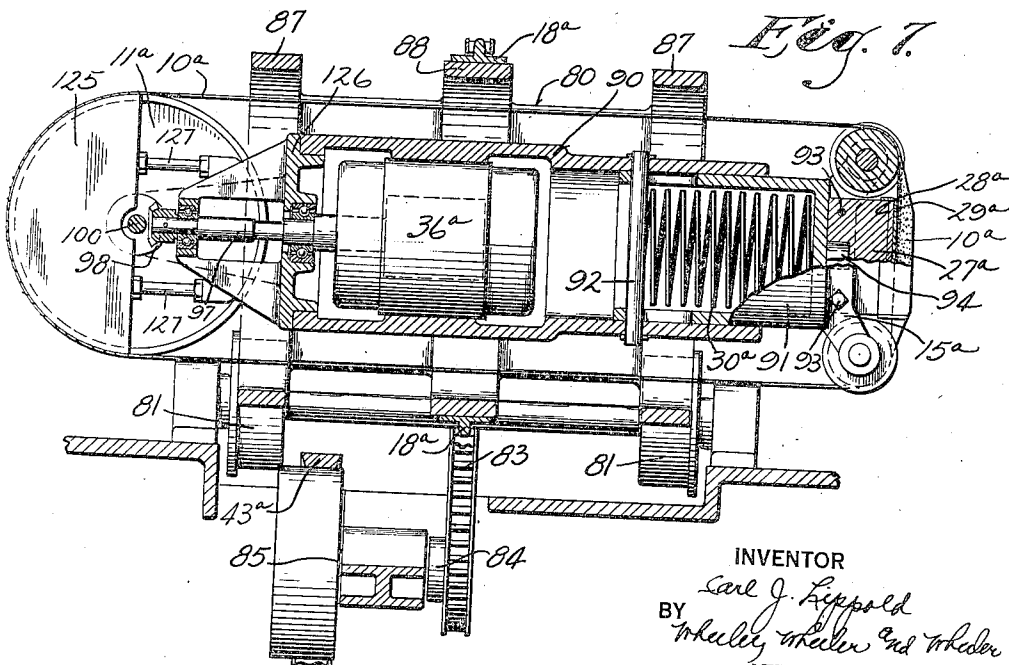


Fig. 7.



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2,109,069

SANDING AND POLISHING MACHINE

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26 Claims. (Cl. 51—135)

This invention relates to improvements in sanding and polishing machines.

My object is to provide means whereby the surface of a sanding or polishing belt may be applied to the work in a movement of transverse advance across the face to be polished, and in a simultaneous movement of rotation with a constant change of direction in all parts of the belt in contact with the work.

More particularly stated, my object is to provide means whereby a revolving endless belt may be supported for rotation about an axis intersecting the working part of the belt and the center of the surface to be polished.

A further object is to provide means whereby an endless belt may be mounted upon a set of rollers, over which it may be driven at high speed, while the belt and its supporting rollers are being revolved at lesser speed about an axis intersecting the belt at two points.

More specifically, my object is to devise a machine peculiarly adapted for polishing operations across the end of the grain of wooden articles and other materials, especially materials having the grain exposed.

In the drawings:

Figure 1 is a side elevation of a simply constructed machine embodying my invention, the casing being partially broken away to disclose the working head, including the polishing belt and associated driving connections.

Figure 2 is a plan view of the machine shown in Figure 1, the housing for the working head being shown in section.

Figure 3 is a front elevation of the working head, with a portion of the belt broken away to show the back plate and pad.

Figure 4 is a fragmentary sectional view drawn generally to line 4—4 of Figure 3.

Figure 5 is a front elevation showing a modified form of working head.

Figure 6 is a sectional view drawn to line 6—6 of Figure 5.

Figure 7 is a side elevation of the working head, the housing being shown in vertical section.

Figure 8 is a detail view of a modified pad or pad roller.

Figure 9 is a detail view of a compound work supporting slide.

Like parts are identified by the same reference characters throughout the several views.

In the embodiment of my invention disclosed in Figures 1 to 4, inclusive, an endless sanding belt 11 is mounted upon three pulleys 11, 12, and

13. The pulley 11 serves as the driving pulley, whereas the pulleys 12 and 13 are idle.

The pulleys 12 and 13 are journaled upon studs 14 connected with a pulley supporting frame 15. The frame 15 is loosely supported to slide upon a pair of rods 16 and 17 extending from the web or spokes of a driving pulley 18 supported from the main frame or housing 19 by a shaft 20. The shaft 20 is journaled in suitable bearing members 21 mounted upon a shelf or portion 22 of the housing 19. The belt driving pulley 11 has its shaft journaled in a bracket 24 also connected with pulley 18, whereby the latter, with the belt, belt supporting pulley, rods 16 and 17, and bracket 24, may be revolved as a unit.

From pulley 12 to pulley 13, the belt travels over a back plate 25 (Figures 3 and 4), which serves as a support against which the belt may be pressed by the work. This back plate is apertured to receive bolts 26, whereby a pad 27 having a concave groove 28, the sides of which conform in curvature to the surface to be polished, may be secured to the plate 25 and interchanged with other pads when the character of the work changes.

This pad 27 may be formed of wood, the channel surfaces preferably having a canvas cover 29 impregnated with graphite, a filler of felt being interposed between the canvas and the wood. Ordinarily the work will have a convex or spherically curved surface when finished, but inasmuch as the pad rotates about the axis of the shaft 20, it will be obvious that all portions of a spherically rounded or convex surface may be polished. The term "sanding belt" is to be understood in its generic sense as including any suitable finishing belt of abrading or buffing material.

The pulley supporting frame 15 is mounted to slide upon the supporting rods 16 and 17, and the belt is held under tension by springs 30 coiled about the rods under compression between the frame 15 and another frame 31 secured to the rods by set screws 32.

The back plate 25 is supported from the pulley supporting frame 15 by the arms 35 shown in Figure 3, whereby this back plate is rigidly connected with the pulley supporting frame 15.

The belt driving pulley 11 is driven from a motor 36 which has its casing secured to the motor carrying frame 31 at one side of the supporting rods 16 and 17. The motor drives the pulley 11 by means of a sprocket chain 37, preferably without reduction in speed.

The pulley 18 and its shaft 20 are driven from a motor 40, a variable speed pulley 42 being em-

ployed to drive the V-belt 43 and thus transmit motion to the pulley 18.

Any suitable variable speed mechanism may be employed to drive the belt 43, but I prefer to employ a divided pulley having its parts held in normal pressure relation to the belt by a compression spring 44. The radius at which the belt is held by the pulley members is determined by adjusting the motor as indicated conventionally in Figure 5. This means for varying speed is of a well known commercial type ordinarily termed a "Reeves variable speed mechanism", and further illustration and description is deemed unnecessary. By shifting the motor to vary the belt tension, the pulley sections may be spread or allowed to approach, as urged by spring 44.

For convenience in description the pulley 18, with associated parts, including the rods 16 and 17, sanding belt 10, and motor 36, may be termed the working head. This working head rotates on the axis of the shaft 20 while the belt 10 is being driven at high speed by the motor 36. Therefore the belt will move longitudinally across the back plate 25 and pad 27, and at the same time this back plate 25, pad, and belt will be rotating on the axis of shaft 20.

The work, indicated at A in Figure 1, will preferably be supported by a pair of steady rests 50 and 51. These steady rests are supported by shanks 52 which are adjustably mounted in suitable sockets in a carrier 54. The shanks are secured at the desired elevation in the sockets by means of set screws 56. In this manner the work can be accurately centered on the horizontal axis regardless of the diameter of the portion engaged by one of the steady rests.

The carrier is supported by parallel links 58 from a pivot bar 61. Collars 62, loosely mounted on the pivot bar, have upwardly projecting ears to which the lower ends of the parallel bars 58 are pivoted at 59. It will be obvious that the carrier 54 may be moved toward and away from the working head of the machine and held in parallelism with the bar 61 during such movement. The steady rests are so adjusted that the axis of the work will be in line with the axis of the shaft 20 and with the center of the pad 27 when the links 58 are swinging in a vertical plane upon their pivot pins 59.

However, the carrier may be swung laterally by rotation of the collars 62 upon the bars 61, and this movement is utilized to carry the work A to a trimming saw 65, preferably driven by a saw actuating motor 66. This provides a convenient means for trimming the end of the work preparatory to the finishing operation to be performed by the sanding belt.

The saw 65 will preferably be mounted upon a chucking head 68 removably connected with the shaft of the motor 66, whereby other chucking heads and trimming tools may be substituted for the saw when occasion requires.

From the foregoing description it will be understood that the work may be mounted in the steady rests 50, 51 while in an unfinished condition. Thereupon the carrier 54 may be swung laterally to bring the inner end of the work into contact with finishing tools such as the saw 65, or any substituted tools connected to be driven by the motor 66. After trimming the inner end of the work, the parallel bars or links 58 will be swung to a position where they can be reciprocated in a vertical plane to carry the work into and out of contact with the sanding belt. In each instance the form of the portion 28 of the

pad 27 will have a contour corresponding with the desired contour of the work after the sanding operation has been completed, and as previously explained, the sanding belt will have a movement across the pad and a simultaneous movement of rotation corresponding with the rotation of the pad, whereby every particle of the sanding belt in contact with the work will be constantly changing its direction of movement while traversing the portion of the work with which it is in contact.

A stop collar 70 may be adjustably secured to the bars 61 by set screw 71. This stop collar has arms 72 and 73 to limit the lateral swinging movements of the link bars 58. The upwardly projecting ears on the collars 62 are connected by a bar 74 which passes between the stop collar arms. Another stop 75 is secured to the outer end of the bars 61 to limit the retractive movement of the carrier 54 by engagement with the outer link bar 58.

In the modified form of construction illustrated in Figures 5, 6, and 7, a major object is to provide means for eliminating vibration or slap, such as might result in large finishing machines of the type disclosed. The gyroscopic effects resulting from the rotation of the sanding belt and its supporting pulleys at high speed, while the working head is being revolved about a different axis and at a different speed, tends to set up lateral strains or movements of distortion, whereby in the larger machines and in high speed machines, more adequate support of the working head becomes desirable. Lack of complete balance also tends to develop slap.

I therefore have illustrated in Figures 5, 6, and 7 a form of construction in which the working head is mounted in a cylindrical drum 80, which is supported for rotation upon idle rollers 81 and provided with a sprocket pulley 18a driven by a sprocket chain 83 from a driving sprocket wheel 84 mounted upon a motor driven shaft 85.

In the construction shown in Figures 5, 6, and 7 the countershaft 85 will preferably be driven from the motor 40 by a suitable belt 43a. As shown in Figure 7, the drum 80 is provided with end collars 87 which support the drum from the rollers 81. A corresponding central collar 88 carries the sprocket pulley 18a. The collars 87 and 88 are preferably of larger diameter than the drum 80, and the drum 80 is concentric with a cylindrical housing 90 which encloses a motor 36a for actuating the driving pulley 11a of the sanding belt.

The housing 90 is supported from the drum 80 by frame members 89, as shown in Figure 5. These frame members are located at one side of the sanding belt 10a, whereby the space occupied by this belt within the drum 80 is unobstructed, thus making it possible to remove and replace belts without withdrawing the housing 90 from the drum 80.

A frame 15a corresponding with the frame 15 shown in Figure 1 is mounted upon a cup-shaped telescoping member 91 which is fitted to slide within the housing 90, from which it is urged by a compression spring 30a, the inner end of which is seated against a cross pin 92. The pad 27a is secured between the side plates of the frame 15a by means of transverse bolts 93, which may be removed to permit substitution of pads.

The pads are substantially like those illustrated in Figures 1 and 4, the canvas covering 29a being extended into a groove 28a, whereby the side margins of the belt 10a are out-turned

as shown in Figure 7. However, the inner surface of the pad will preferably be directly seated upon the end of the telescoping cup-shaped member 91, the pad being provided with a socket to receive a centering pin 94.

The sanding belt motor 36a is mounted in the housing 90, and the driving pulley 11a of the sanding belt is formed in two sections, each mounted upon the shaft 100, with sufficient space between the sections to allow the motor shaft 97 to project between them and carry the pinion 98. The pinion 99 is mounted on pulley shaft 100, and the belt 10a spans the pulley rims or rim sections, as clearly shown in Figure 6.

Any suitable means may be employed for conveying electrical energy to the belt driving motors 36 or 36a. In Figure 1 a pair of rings 105 and 106 are mounted upon the shaft 20 and receive current from a set of brushes 107 and 108. Rings 105 and 106 may be electrically connected to the motor 36 by suitable wires 109.

In Figure 6 a pair of rods 112 and 113 support a disk 115 provided with concentric slip rings 116 which receive current from suitable brushes 117 carried by a relatively stationary frame rod 118. The rings 116 are electrically connected with the motor 36a. Three rings are illustrated in Figure 6, it being assumed that a three-phase motor is being employed.

Inasmuch as the supporting arms 89 which carry the housing 90 are located at one side of the space occupied by the sanding belt, suitable counterbalance is applied at 120 at the opposite side of this space. The working head disclosed in Figures 1 to 4, inclusive, is also counterbalanced as indicated at 121.

In the construction disclosed in Figures 5, 6, and 7, the belt pulley assembly is not only carried by a substantially rigid cylindrical housing 90, but this housing is rigidly supported from the drum 80 by arms 89 of adequate strength, any desired number of these arms being employed along the length of the cylinder 90. The drum 80 being supported at its respective ends by the rollers 81, to which it is held by the sprocket chain 83 exerting its pull upon the central portion of the drum, it will be obvious that the belt driving pulley 11a is entirely relieved from strain, and that the resistance will be entirely adequate to hold the assembly to a true axis of rotation.

To prevent the belt from being drawn between the spaced pulley members, a filler block 125 of a generally semi-cylindrical form is supported from the drum head 126 by rods 127. A slight inward buckling of the central portion of the belt causes it to find support on the curved surface of the block 125. The latter is impregnated with graphite, at least along this bearing surface, thereby reducing the friction to a minimum.

In Figure 8 a grooved roller 27b is supported from a pulley supporting frame member 15b by a set of outwardly projecting ears 128 in which the roller trunnions 129 are journaled. This roller 27b constitutes a rotary pad over which the sanding belt may travel. The axis of the work, if projected, would, of course, intersect the center of this roller.

In Figure 9 I have illustrated a modified work support, in which the adjustable posts 52c are mounted upon a cross slide 130 carried by a main slide 131 supported from the main frame by a bracket 61c. The slide 131 allows the work to be moved into and out of contact with the sanding belt, and the slide 130 allows it to be moved lat-

erally to the trimming tools, i. e., to the saw 65 or other trimmers.

I claim:

1. In a machine of the described class, the combination with a pulley support, a set of pulleys mounted thereon, an endless belt mounted for travel about said pulleys, and means for rotating the pulley support about an axis intersecting the belt between two of said pulleys, said support being provided with a relatively fixed belt supporting pad also intersected by said axis, whereby work may be pressed against the belt along said axis for polishing operations by the portion of the belt traversing said pad.

2. In a machine of the described class, the combination with a pulley support, a set of pulleys mounted thereon, an endless belt mounted for travel about said pulleys, and means for rotating the pulley support about an axis intersecting the belt between two of said pulleys, said support being provided with a relatively fixed belt supporting pad also intersected by said axis, whereby work may be pressed against the belt along said axis for polishing operations by the portion of the belt traversing said pad, said pad being provided with a belt receiving groove, the sides of which are contoured in correspondence with the desired contour of the work in planes extending radially from said axis.

3. In a machine of the described class, the combination with a pulley support, a set of pulleys journaled on said support, an endless belt mounted for travel about said pulleys, a motor mounted on said support and operatively connected to drive one of said pulleys, and means for rotating the pulley support about an axis intersecting the belt between two of said pulleys, said support having a contoured backing pad for said portion of the belt intersected by the axis, and a work support movable to carry work into and out of contact with the belt on the side opposite said pad.

4. In a machine of the described class, the combination with a rotary shaft and means for actuating the same at variable speeds, of a working head secured to said shaft and provided with a set of belt carrying pulleys, a belt mounted for travel about said pulleys across the extended axial line of said shaft, a contoured backing pad for the portion of said belt extending across said axial line, and means for pressing the work to be polished against the opposite side of the belt from that occupied by the pad.

5. In a machine of the described class, the combination with a rotary working head having parallel rods at opposite sides of the axis of rotation, a belt driving pulley supported adjacent said rods at one end, a slide connecting the other ends of said rods and provided with belt carrying pulleys, an endless belt mounted for travel about said pulleys, a contoured pad-like support for said belt carried by said slide intermediate of its associated pulleys, means for resiliently urging said slide in a belt tensioning direction, a work carrier adapted to support work in contact with the portion of the belt traversing said pad, means for actuating the belt driving pulley, and means for rotating the working head at a speed independent of that of the belt driving pulley.

6. In a machine of the described class, the combination with a rotary working head provided with a belt adapted for lineal travel across the axis of rotation, a work carrier provided with a set of independently adjustable work supporting rests, means for guiding said work carrier along the axial line of rotation of the working head, 75

a laterally swinging support for the work carrier, and a rotary trimming tool holder adapted to support saws and other trimming tools in a position to trim the work supported by the work carrier when swung laterally to carry the work from normal position in axial alignment with the working head.

7. In a machine of the described class, the combination with a motor driven rotary working head, a motor driven belt carried by said working head, an associated motor driven rotary support for trimming tools, and a work carrier movable to convey work into contact with a belt carried by said working head and also movable laterally to carry the work into contact with trimming tools carried by said rotary trimming tool support.

8. In a machine of the described class, the combination of a rotary pressure receiving pad for a sanding belt, provided with a cylindrically curved groove to receive the belt, and means for driving the belt and simultaneously rotating the pad and belt about an axis intersecting the central portion of the pad.

9. In a machine of the described class, the combination of a rotary pressure receiving pad for a sanding belt, provided with a cylindrically curved groove to receive the belt, and means for driving the belt and simultaneously rotating the pad and belt about an axis intersecting the central portion of the pad, said pad groove having a cushioned canvas covering impregnated with anti-frictional material.

10. In a machine of the described class, the combination of a working head, including a rotary drum, a concentric cylindrical housing, and pulley supports and pulleys associated with the housing and adapted to support an endless belt for operation between the housing and drum and across the space at one end of the housing, a supporting pad for the belt at said end of the drum, and a work support movable toward and away from said pad.

11. In a machine of the described class, the combination with a belt supporting pulley assembly, of means for driving one of the pulleys, means for rotating the pulley assembly about an axial line intersecting the belt between pulleys, a pad supporting block mounted upon the pulley assembly, a pad detachably connected therewith and provided with a cylindrically curved channel to receive the belt, and means for supporting and guiding work into and out of contact with the opposite side of the belt from that traversing said groove.

12. In a machine of the described class, a pulley assembly including belt supporting pulleys and a driving pulley for bodily rotating the assembly, a motor operatively connected to rotate said driving pulley, and another motor mounted within the pulley assembly and substantially at its axis of rotation for independently driving a polishing belt carried by the belt supporting pulleys.

13. In a machine of the described class, a work carrier provided with work supporting rests, parallel linkage arms for supporting the work carrier, a supporting rod, and collars mounted for oscillation on said rod and pivotally connected with said arms, whereby the arms may be reciprocated to move the work lineally and oscillated to move the work laterally.

14. In a machine of the described class, a work carrier provided with work supporting rests, parallel linkage arms for supporting the work carrier, a supporting rod, collars mounted

for oscillation on said rod and pivotally connected with said arms, whereby the arms may be reciprocated to move the work lineally and oscillated to move the work laterally, and work trimming devices in the path of portions of the work when swung laterally.

15. In a machine of the described class, a belt supporting pulley assembly mounted upon a cylindrical support, and a rotary drum concentric with the cylindrical support and secured along one side of the cylindrical support to maintain the latter with its axis coinciding with the axis of the drum.

16. In a machine of the described class, a belt supporting pulley assembly mounted upon a cylindrical support, and a rotary drum concentric with the cylindrical support and secured along one side of the cylindrical support to maintain the latter with its axis coinciding with the axis of the drum, said drum being provided with supporting rollers at opposite sides of its lower portion, and having rings associated with the ends of the drum in positions for registry with said rollers.

17. In a machine of the described class, the combination with supporting rollers, of a drum having end rings mounted on said rollers, a cylindrical support secured to the drum along one side and provided with a pulley assembly for carrying a revolving belt along the axis of said support, said belt being removable between the support and drum on the side opposite that at which the support is connected with the drum.

18. In a machine of the described class, the combination with a rotary support, of a belt driving pulley assembly carried by said support and including a movable frame upon which two of the pulleys are journaled, and means for resiliently supporting said frame under belt tensioning pressure tending to project it from one end of the support, said frame being centrally provided with a backing pad for the belt adapted to support an associated portion of the belt when the latter is subjected to pressure of work applied to the opposite side of the belt.

19. The combination with a flexible polishing member, a channel-shaped pad adapted to support the polishing surface of said member in a concave position in the field of its contact with the work, means for rotating the pad and polishing member upon an axis intersecting the pad and the working portion of the polishing member, and means for additionally moving the polishing member along the axis about which it is concavely curved and transversely of said axis of rotation.

20. The combination with a work support, of a polishing member relatively movable with reference to work carried by said support, means for predetermining the contour of the polishing member in the area of its contact with the work, means for effecting relative rotation between the polishing member and the work, and means for simultaneously shifting the polishing member across the axis of rotation, and progressively contouring the polishing member in correspondence with the predetermined contour of the work when finished.

21. In a machine of the described class, a divided pulley for driving a finishing belt, and a filler block mounted upon a relatively stationary support and having an arcuate surface in a position to support the portion of the belt extending to said pulley.

22. The combination with a rotative pulley support provided with a set of belt carrying pulleys, an endless belt mounted for travel about

said pulleys and across the axial line of support rotation and in a plane to which said line is substantially perpendicular, a work support adapted to carry work into and out of contact with said belt along said axial line, and means for driving the belt over said pulleys with the portion crossing said axial line in contact with the work while the support is being rotated.

23. The combination of a working head and means for supporting work in proximity thereto, driving connections for effecting relative rotation of the head and the work, and means carried by the head for supporting and actuating a strip of abrasive material in contact with the work and in a plane perpendicular to the axial line of relative rotation of the head and work and across said line between the head and work.

24. The combination with a rotative finishing head, of a work support movable along the axis of head rotation, a set of pulleys mounted at one end of the head on opposite sides of said axis, and a third pulley mounted in the other end portion of the head in line with said axis, said pulleys having shafts at right angles to the axis of head rotation, an endless abrasive belt mounted on said pulleys, belt driving means carried by the head, and separate means for rotating the head, the portion of the belt between the first mentioned pulleys being positioned across the axis of head rotation for contact with the work while moving in a plane substantially normal to said axis.

25. In a machine for polishing ends of elongated pieces of work, the combination with a belt supporting pulley assembly, means for rotating said pulley assembly about an axis intersecting the belt and substantially perpendicular thereto at the point of intersection, pulleys carried by

said assembly on opposite sides of said axis in positions to support said belt in a plane transverse to said axis, a power driven pulley for actuating said belt, a pad support mounted upon the pulley assembly between the first mentioned pulleys, a pad carried by said support and having a cylindrically curved channel to receive a portion of the belt, and means for supporting and guiding elongated pieces of work to move their ends into and out of contact with portions of the belt traveling across said grooved pad, said pad being located across the axial line about which the pulley assembly rotates.

26. The combination with a housing for a pulley assembly, a rotative pulley assembly in said housing including a frame provided with a driving pulley at one end portion of the frame and a pair of spaced pulleys at opposite sides of the axis of rotation near the other end portion of the frame, an abrading belt mounted on said pulleys, power driven connections for rotating the pulley assembly, a motor within the pulley assembly operatively connected to actuate the driving pulley, a cylindrical housing for said motor provided with a telescoping extension, a spring adapted to urge said telescoping extension in an outward direction, a belt supporting pad carried by said extension and adapted to be urged thereby against a portion of the belt extending between said pulleys across the axial line of frame rotation, and means for moving work into and out of contact with the pad supported portion of the belt for abrasion by particles on the belt surface having movement along the line of belt travel and simultaneous rotative movement due to rotation of the frame.

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